

REMARKS

Claims 35-47, 49-52, and 54 are pending. Claims 35, 36, 40, 43, and 49 have been amended to recite geothermal brine and to clarify the invention. New claims 55-62 have been added. Support for these amendments can be found, *inter alia*, in the specification at paragraphs [0021], [0022], [0023], [0039], and [0055]. Applicant requests reconsideration in view of the amendments and remarks provided herein.

The Pending Claims are Patentable Over the Cited Art

The only remaining issue in this case is an obviousness rejection. Claims 35-47, 49-52, and 54 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Higgins or Higgins in view of Cardwell.

As a first consideration, the claims have been amended to specify that the source of the material for purification is a geothermal brine. The cited references fail to teach or suggest the use of this starting material for the intended goal.

According to the Examiner, Higgins describes the removal of impurities by oxidizing, the obtaining of calcium depleted solution, and the electrowinning of the manganese in a hydrochloric acid bath to deposit manganese dioxide. Office Action dated April 30, 2008 at p. 2-3. In particular, Higgins describes a procedure for electrodeposition of manganese using dilute (~ 0.1 M) HCl solutions at temperatures ranging from 70 to 90 °C. The process involves use of a continuous ion-exchange step to maintain low concentrations of HCl. As observed by the Examiner, Higgins fails to teach the use of a QL-type reagent to remove other non-manganese impurities from the solution. The Examiner employs Cardwell to allegedly fill this gap.

However, one of ordinary skill in the art would not have been motivated to use the methods of Cardwell in the manner presently claimed. The Cardwell disclosure is directed to separating metal constituents from ocean floor nodules rather than geothermal brine. Because Cardwell focuses on nodules, the bulk of its teachings employ high-energy methods (mechanical crushing and greatly elevated temperatures) in its purification steps. Cardwell, col. 5, lines 10-60. Where Cardwell does discuss aqueous hydrogen halide methods to extract manganese at moderate

temperatures, see col. 5, line 62-col. 6, line 15, and col. 20, lines 5-38, it teaches that high concentrations of HCl are required and even advocates continuously bubbling HCl into the system (col. 20, lines 32-34). Cardwell emphasizes the pH of the extraction solution should not be greater than about 2 to avoid precipitation of copper salts, and preferably should range from about 1 to about 2 (col. 20, lines 35-38). The present invention employs lower concentrations of HCl and the preferred pH range during the extraction is from about 2 to about 4. The specification makes clear that pH control is critical to the efficiency of the extraction and notes that at a pH of 1.5, extraction efficiency for manganese is effectively zero. Specification, para. [0039]. Newly added claims 55-62 reflect pH control in the range of 2 to 4.

Furthermore, Cardwell teaches that when an aqueous mixture of manganese, iron, and other metals is treated with an organic solution of a trialkyl phosphate or an amine (col. 20, lines 39-45), only iron is extracted. In the present invention, the claimed QL reagent comprises an organic solvent, a trialkyl phosphate and a quarternary amine. Furthermore, as the specification makes clear, the claimed QL reagent extracts both manganese and iron from the geothermal brine under the claimed conditions. Based on the Cardwell disclosure, one skilled in the art would not be motivated to employ the Cardwell conditions to produce the claimed results.

In summary, the cited references fail to teach or suggest all the limitations of the claimed invention. The present rejection should be withdrawn in view of the deficiencies in the cited references as discussed above.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no. 144092000401. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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